

REMARKS

Claims 1-39 are all the claims presently pending in the application. Claim 11 is amended to more clearly define the invention. Claims 1, 11, 33, 36, and 38-39 are independent.

These amendments are made only to more particularly point out the invention for the Examiner and not for narrowing the scope of the claims or for any reason related to a statutory requirement for patentability.

Applicant also notes that, notwithstanding any claim amendments herein or later during prosecution, Applicant's intent is to encompass equivalents of all claim elements.

Applicant gratefully acknowledges that claims 33-37 and 39 are allowed. However, Applicant respectfully submits that all of the claims are allowable.

Applicant gratefully acknowledges that claims 5-6, 13-21, and 24-25 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. However, Applicant respectfully submits that all of the claims are allowable.

Claims 1-4, 8-10, and 38 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the Hata et al. reference. Claims 11-12, 22-23, 27-29, and 31-32 stand rejected under 35 U.S.C. § 102(e) as being anticipated by the Matsuda reference. Claim 7 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the Hata et al. reference in view of the Hoffmeyer reference. Claims 26 and 30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the Matsuda reference in view of the Hoffmeyer reference.

These rejections are respectfully traversed in the following discussion.

I. THE CLAIMED INVENTION

A first exemplary embodiment of the claimed invention, as defined by, for example, independent claim 1, is directed to an interposer that includes an array of buttons on a carrier having a proximity to each other that allows contact between two adjacent buttons to occur when

the two adjacent buttons are compressed above a predetermined threshold.

A second exemplary embodiment of the claimed invention, as defined by, for example, independent claim 11, is directed to a chip package that includes a chip having a first surface and a second surface, a printed circuit board having a first surface and a second surface, and an interposer having an array of buttons between the chip and the printed circuit board. The first surfaces are closer to each other than the second surfaces and the first surfaces face each other and the second surfaces face each other.

Conventional technology includes an array of compressible buttons on a sheet that is sandwiched between a printed circuit board and a chip carrier that each have contact pads that align with and compress the buttons between them. However, the conventional technology is not acceptable for use with a controlled impedance transmission line over a wide frequency band due to signal distortion.

In stark contrast, the present invention provides an interposer that includes an array of buttons on a carrier having a proximity to each other that allows contact between two adjacent buttons to occur when the two adjacent buttons are compressed above a predetermined threshold. In this manner, the present invention provides an interposer that is acceptable for use with a controlled impedance transmission line over a wide frequency band (page 5, lines 6-10).

II. THE 35 U.S.C. § 112, SECOND PARAGRAPH REJECTION

The Examiner alleges that claims 31-32 are indefinite. In particular, “[t]he Examiner does not understand the term ‘laminations.’ The examiner will interpret this term to mean that something is on the surfaces.”

Support for the term laminations is found in the specification at, for example, page 12, lines 6-13. In particular, the specification points out that “[i]n an exemplary embodiment, the surfaces that provide the differential compression (as shown for example in Fig.5) may be

provided using chip carriers that have layered materials (laminations). These shapes can be punched out of the individual layers (e.g., the green sheets in the case of a ceramic module or laminations in the case of an organic carrier) to create the varying levels.”

In other words, the specification makes it clear that a lamination can be a layered material.

Applicant submits that such would be clear to one of ordinary skill in the art to allow them to know the metes and bounds of the invention, taking the present Application as a whole.

In view of the foregoing, the Examiner is respectfully requested to withdraw this rejection.

III. THE PRIOR ART REJECTIONS

A. The 102(e) Hata et al. reference rejection

Regarding the rejection of claims 1-4, 8-10, and 38, the Examiner alleges that the Hata et al. reference teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by the Hata et al. reference.

None of the applied references teaches or suggests the features of the claimed invention including an interposer that includes an array of buttons on a carrier having a proximity to each other that allows contact between two adjacent buttons to occur when the two adjacent buttons are compressed above a predetermined threshold. As explained above, these features are important for providing an interposer that is acceptable for use with a controlled impedance transmission line over a wide frequency band.

In stark contrast, the Hata et al. reference merely discloses a standard process for flip chip attachment of a semiconductor device to a substrate using a “C4” type process. In particular, the Hata et al. reference discloses supplying a mixed paste 9 to the pads 4 of an intermediate substrate 2 (Fig. 4A), mounting the semiconductor chip 1 (Fig. 4B), subjecting the mixed paste 9 to reflow

heating so that a connecting portion is obtained (Fig. 4C), sealing the periphery of the chip using sealing resin 12 (Fig. 4D), supplying solder balls 14 to pads 13 of the intermediate substrate 2 (Fig. 4E), providing solder 17 to wiring lands 16 of a printed circuit board 18 (Fig. 5A) and subjecting the solder balls 14 and the receiving solder 17 to reflow heating to obtain the mounting structure 19 (Fig. 5B).

In other words, the connections that are established using the solder balls that are disclosed by the Hata et al. reference are entirely the result of exposing the solder balls to reflow, which is a melting of the conglomerate of metal balls.

The Hata et al. reference does not teach or suggest anything at all that is even remotely related to compression, let alone an array of buttons on a carrier having a proximity to each other that allows contact between two adjacent buttons to occur when the two adjacent buttons are compressed above a predetermined threshold.

The Hata et al. reference does not mention any deviation at all from a standard reflow technique in which the objects are allowed to accommodate themselves as the solder melts.

Further, the solder balls that are disclosed by the Hata et al. reference are not supposed to contact each other. Indeed, any contact between the solder balls that are disclosed by the Hata et al. reference would result in a failure of the attachment process.

Therefore, the Hata et al. reference does not teach or suggest each and every element of the claimed invention and the Examiner is respectfully requested to withdraw this rejection of claims 1-4, 8-10, and 38.

B. The 102(e) Matsuda reference rejection

Regarding the rejection of claims 11-12, 22-23, 27-29, and 31-32, the Examiner alleges that the Matsuda reference teaches the claimed invention. Applicant submits, however, that there are elements of the claimed invention which are neither taught nor suggested by the Matsuda

reference.

None of the applied references teaches or suggests the features of the claimed invention including a chip having a first surface and a second surface, a printed circuit board having a first surface and a second surface, where the first surfaces are closer to each other than the second surfaces, and the first surfaces face each other and the second surfaces face each other. As explained above, this feature is important for providing an interposer that is acceptable for use with a controlled impedance transmission line over a wide frequency band.

An exemplary embodiment of these features is illustrated by, for example, Figure 10 of the present specification. The connector 1002 has a first surface 1006 and a second surface 1004 while the other device has a first surface (pedestal) and a second surface (recess). The first surfaces are closer to each other than the second surfaces and the first surfaces face each other in the pedestal region while the second surfaces face each other in the recess region. In this manner, the buttons between the first surfaces are compressed more than the buttons between the second surfaces, thereby, determining which of the buttons are depressed.

Rather, and in stark contrast, the Matsuda reference only discloses a planar construction in all of the figures. Indeed, none of the devices that are disclosed by the Matsuda reference include a chip having a first and second surface and a printed circuit board having a first and second surface, where the first surfaces face each other and the second surfaces face each other.

The Matsuda reference discloses a component 12 and a wiring substrate 11 which each only include a first surface that faces the other first surface. Neither of the component 12 and the wiring substrate 11 include a second surface which faces the other second surface.

Therefore, the Matsuda reference does not teach or suggest each and every element of the claimed invention and the Examiner is respectfully requested to withdraw this rejection of claims 11-12, 22-23, 27-29, and 31-32.

C. The Hata et al. reference in view of the Hoffmeyer reference

Regarding claim 7, the Examiner alleges that the Hoffmeyer reference would have been combined with the Hata et al. reference to form the claimed invention. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, the references are directed to completely different and unrelated matters and problems.

Specifically, the Hata et al. reference is directed to the problem of providing an alternate material for solder including a large amount of lead and having a high melting point for use in connecting electronic components or providing a lead-free material for a barrel-shaped pad called a “C4 connection.” ([0006]).

In stark contrast, the Hoffmeyer reference is directed to the completely different and unrelated problem of the interfaces that are created between connector contacts and board surfaces in a land grid array (LGA) connector are subject to potential reliability degradation from the entrance of corrosive environmental gases and particulate debris into the LGA contact areas. (Col. 1, lines 26-42).

One of ordinary skill in the art who was concerned with providing an alternate material for a solder as the Hata et al. reference is concerned with providing would not have referred to the Hoffmeyer reference because the Hoffmeyer reference is directed to the completely different and unrelated problem of entrance of corrosive environmental gases and particulate debris into LGA contact areas. Thus, the reference would not have been combined.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner.

The Examiner alleges that it would have been obvious to “one of ordinary skill in the art

to modify the buttons of Hata (sic) by making them contain an elastomeric compound having embedded metallic particles as taught by Hoffmeyer (sic). The motivation for this change would be to alter the signal to noise ratio of the interposer."

"To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings." (Emphasis added, M.P.E.P. §2143)

However, the Examiner's alleged modification does not provide the result that the Examiner contends is the motivation for making the modification.

The Examiner alleges that the motivation for modifying the buttons to make them contain an elastomeric compound would result in an altered signal to noise ratio. However, such a modification would have absolutely no affect on the noise ratio.

Further, the Examiner does not provide any support for the allegation that merely modifying the buttons to make them an elastomeric compound would result in an altered signal to noise ratio.

The Examiner clearly does not cite any portion of the applied references for such an allegation.

Should the Examiner contend that such a motivation is well known, Applicant hereby respectfully demands evidence supporting the Examiner's contention. Otherwise, the Examiner is required to withdraw the rejection.

Even assuming arguendo that one of ordinary skill in the art would have been motivated to combine these references, the combination would not teach or suggest each and every element of the claimed invention.

None of the applied references teaches or suggests the features of an array of buttons on a

carrier having a proximity to each other that allows contact between two adjacent buttons to occur when the two adjacent buttons are compressed above a predetermined threshold as recited by independent claim 1. As explained above, these features are important for providing an interposer that is acceptable for use with a controlled impedance transmission line over a wide frequency band.

In stark contrast, the Hata et al. reference merely discloses a standard process for flip chip attachment of a semiconductor device to a substrate using a "C4" type process. In particular, the Hata et al. reference discloses supplying a mixed paste 9 to the pads 4 of a intermediate substrate 2 (Fig. 4A), mounting the semiconductor chip 1 (Fig. 4B), subjecting the mixed paste 9 to reflow heating so that a connecting portion is obtained (Fig. 4C), sealing the periphery of the chip using sealing resin 12 (Fig. 4D), supplying solder balls 14 to pads 13 of the intermediate substrate 2 (Fig. 4E), providing solder 17 to wiring lands 16 of a printed circuit board 18 (Fig. 5A) and subjecting the solder balls 14 and the receiving solder 17 to reflow heating to obtain the mounting structure 19 (Fig. 5B).

In other words, the connections that are established using the solder balls that are disclosed by the Hata et al. reference are entirely the result of exposing the solder balls to reflow, which is a melting of the conglomerate of metal balls.

The Hata et al. reference does not teach or suggest anything at all that is even remotely related to compression, let alone an array of buttons on a carrier having a proximity to each other that allows contact between two adjacent buttons to occur when the two adjacent buttons are compressed above a predetermined threshold.

The Hata et al. reference does not mention any deviation at all from a standard reflow technique in which the objects are allowed to accomodate themselves as the solder melts.

Further, the solder balls that are disclosed by the Hata et al. reference are not supposed to contact each other. Indeed, any contact between the solder balls that are disclosed by the Hata et

al. reference would result in a failure of the attachment process.

The Hoffmeyer reference does not remedy the deficiencies of the Hata et al. reference.

The Hoffmeyer reference merely discloses applying a compressive force to ensure that contact bumps make a reliable contact, be they made of springs, fuzz buttons, or silver loaded elastomer.

The Hoffmeyer reference does not teach or suggest an array of buttons on a carrier having a proximity to each other that allows contact between two adjacent buttons to occur when the two adjacent buttons are compressed above a predetermined threshold as recited by independent claim 1.

Therefore, the Examiner is respectfully requested to withdraw the rejection of claim 7.

D. The Matsuda reference in view of the Hoffmeyer reference

Regarding claims 26 and 30, the Examiner alleges that the Hoffmeyer reference would have been combined with the Matsuda reference to form the claimed invention. Applicant submits, however, that these references would not have been combined and even if combined, the combination would not teach or suggest each and every element of the claimed invention.

Applicant submits that these references would not have been combined as alleged by the Examiner. Indeed, the references are directed to completely different and unrelated matters and problems.

Specifically, the Matsuda reference is directed to the problem of repetitive shearing stress induced in conductive bumps stacked between a printed wiring substrate and a mounted component. (Col. 2, lines 6-12).

In stark contrast, the Hoffmeyer is directed to the completely different and unrelated problem of the interfaces that are created between connector contacts and board surfaces in a land grid array (LGA) connector are subject to potential reliability degradation from the entrance

of corrosive environmental gases and particulate debris into the LGA contact areas. (Col. 1, lines 26-42).

One of ordinary skill in the art who was concerned with the problem of repetitive shearing stress induced in conductive bumps stacked between a printed wiring substrate and a mounted component as the Matsuda reference is concerned would not have referred to the Hoffmeyer reference because the Hoffmeyer reference is directed to the completely different and unrelated problem of entrance of corrosive environmental gases and particulate debris into LGA contact areas. Thus, the reference would not have been combined.

Further, Applicant submits that the Examiner can point to no motivation or suggestion in the references to urge the combination as alleged by the Examiner.

The Examiner alleges that it would have been obvious to “one of ordinary skill in the art to modify the buttons of Matsuda (sic) by making them contain an elastomeric compound having embedded metallic particles as taught by Hoffmeyer (sic). The motivation for this change would be to alter the signal to noise ratio of the interposer.”

“To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings.” (Emphasis added, M.P.E.P. §2143)

However, the Examiner’s alleged modification does not provide the result that the Examiner contends is the motivation for making the modification.

The Examiner alleges that the motivation for modifying the buttons to make them contain an elastomeric compound would result in an altered signal to noise ratio. However, such a modification would have absolutely no affect on the noise ratio.

Further, the Examiner does not provide any support for the allegation that merely

modifying the buttons to make them an elastomeric compound would result in an altered signal to noise ratio.

The Examiner clearly does not cite any portion of the applied references for such an allegation.

Should the Examiner contend that such a motivation is well known, Applicant hereby respectfully demands evidence supporting the Examiner's contention. Otherwise, the Examiner is required to withdraw the rejection.

Even assuming arguendo that one of ordinary skill in the art would have been motivated to combine these references, the combination would not teach or suggest each and every element of the claimed invention.

None of the applied references teaches or suggests the features of the claimed invention including a chip having a first surface and a second surface, a printed circuit board having a first surface and a second surface, where the first surfaces are closer to each other than the second surfaces, and the first surfaces face each other and the second surfaces face each other. As explained above, this feature is important for providing an interposer that is acceptable for use with a controlled impedance transmission line over a wide frequency band.

As explained above, the Matsuda reference clearly does not teach or suggest these features.

The Hoffmeyer reference does not remedy the deficiencies of the Matsuda reference. Indeed, the Examiner does not allege that the Hoffmeyer reference teaches or suggests the features of the claimed invention including a chip having a first surface and a second surface, a printed circuit board having a first surface and a second surface, where the first surfaces are closer to each other than the second surfaces, and the first surfaces face each other and the second surfaces face each other.

Therefore, the Examiner is respectfully requested to withdraw the rejections of claims 26

and 30.

IV. FORMAL MATTERS AND CONCLUSION

The Office Action objects to the drawings. This Amendment encloses a replacement drawing sheet which corrects Figures 1-3 to include the legend "Prior Art." Applicant respectfully requests withdrawal of this objection.

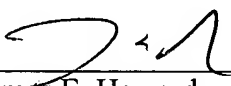
In view of the foregoing amendments and remarks, Applicant respectfully submits that claims 1-39, all the claims presently pending in the Application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the Application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Assignee's Deposit Account No. 50-0510.

Respectfully Submitted,

Date: 3/22/00


James E. Howard
Registration No. 39,715

McGinn & Gibb, PLLC
8321 Old Courthouse Rd., Suite 200
Vienna, Virginia 22182
(703) 761-4100
Customer No. 48150

AMENDMENTS TO THE DRAWINGS

This Amendment encloses a replacement drawing sheet which corrects Figures 1-3 to include the legend "Prior Art." Applicant respectfully requests withdrawal of this objection.

Attachments: Replacement Sheet

Annotated Sheet Showing Changes

ANNOTATED SHEET SHOWING CHANGES

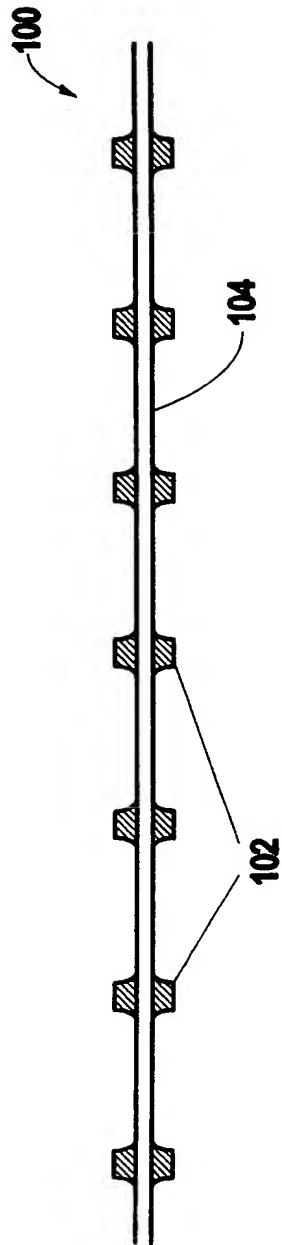


FIG. 1 PRIOR ART

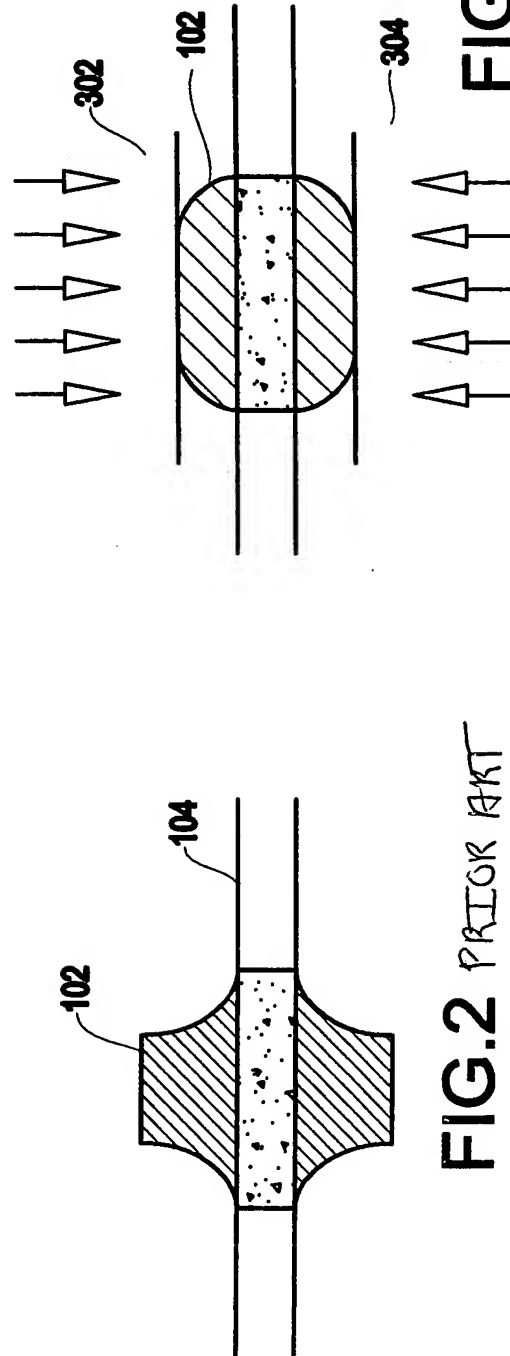


FIG. 2 PRIOR ART

FIG. 3 PRIOR ART